

## SECTION 23 05 13

### COMMON MOTOR REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this and other Sections of Division 23.

##### 1.2 SUMMARY

- A. Section Includes:
  - 1. Basic requirements for factory-installed and field-installed motors.
  - 2. Furnish and install motors for equipment specified in Division 23 Mechanical Sections of the Specifications.

##### 1.3 SUBMITTALS

- A. Compliance Review: In addition to the submittal requirements of this section, preorder bidders shall provide a Compliance Review of the Specifications and Addenda. The Compliance Review shall be a paragraph-by-paragraph review of the Specifications with the following information, "C", "D," or "E" marked in the margin of the original Specifications and any subsequent Addenda.
  - 1. "C": Comply with no exceptions.
  - 2. "D": Comply with deviations. For each and every deviation, provide a numbered footnote with reasons for the proposed deviation and how the intent of the Specification can be satisfied.
  - 3. "E": Exception, do not comply. For each and every exception, provide a numbered footnote with reasons and possible alternatives.
  - 4. The notes associated with "D" and "E" responses shall be typewritten and submitted alongside the compliance review for review by the Design Professional.
  - 5. Unless a deviation or exception is specifically noted in the Compliance Review, it is assumed that the Bidder is in complete compliance with the plans and Specifications. Deviations or exceptions taken in cover letters, subsidiary documents, by omission or by contradiction do not release the Bidder from being in complete compliance, unless the exception or deviation has been specifically noted in the Compliance Review submitted with the Bid.
- B. Product Data: Show nameplate data and ratings; characteristics; mounting arrangements; size and location of winding termination lugs, conduit entry, and grounding lug; and coatings.
- C. Factory Test Reports: For specified tests.

- D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

#### 1.4 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Listing and Labeling: Provide motors specified in this Section that are listed and labeled.
  - 1. Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.

### PART 2 - PRODUCTS

#### 2.1 BASIC MOTOR REQUIREMENTS

- A. Basic requirements apply to HVAC equipment motors, unless otherwise indicated.
- B. Motors ½ HP and Larger: Polyphase.
- C. Motors Smaller than ½ HP: Single phase.
- D. Frequency Rating: 60 Hz.
- E. Voltage Rating: Determined by voltage of circuit to which motor is connected.
- F. Service Factor: According to NEMA MG 1, unless otherwise indicated.
- G. Capacity and Torque Characteristics: Rated for continuous duty and sufficient to start, accelerate, and operate connected loads at designated speeds, in indicated environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
- H. Enclosures: Open drip proof and Totally Enclosed Fan Cooled. Motor enclosure shall be appropriate for installation environment.
- I. Provide factory installed bearing protection to prevent damage caused by adjustable frequency drive shaft induced currents.
  - 1. Aegis bearing protection rings installed in accordance with the manufacturers' requirements or an approved equal.

#### 2.2 EQUIPMENT MOTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. General Electric
  - 2. Gould
  - 3. Lincoln Electric

4. Westinghouse
  5. Baldor
- B. Motors  $\frac{1}{2}$  horsepower and larger (unless otherwise indicated): suitable for 460 volt, three phase, 60 Hz operation; motors less than  $\frac{1}{2}$  horsepower: Suitable for 120 volt, single phase, 60 Hz operation. In general, and unless otherwise specified, all motors will be of the continuous rated open type, 40 degrees C (104 degrees F) temperature rise, ball bearing, squirrel cage induction type, of horsepower and speed indicated on the Drawings.
- C. Motors: Built to meet the requirements of the NEMA Standards, tested in accordance with the standards of the American Standards Association C50, and meeting the requirements of these standards for insulation resistance and dielectric strength.
- D. All motors shall have copper windings.
- E. All motors shall be premium-efficiency type.

## 2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, medium induction motor.
1. Design Characteristics: NEMA MG 1, Design B, unless otherwise indicated.
  2. Energy-efficient design.
  3. Stator: Copper windings, unless otherwise indicated. Multi-speed motors have separate winding for each speed.
  4. Rotor: Squirrel cage, unless otherwise indicated.
  5. Bearings:
    - a. Double-shielded, pre-lubricated ball bearings suitable for radial and thrust loading.
    - b. All bearings shall be designed for L-10 equal to 200,000 hour minimum life hours of continuous service.
  6. Temperature Rise: Match insulation rating, unless otherwise indicated.
  7. Insulation: Class F, unless otherwise indicated.
- B. Motors Used with Reduced-Inrush Controllers: Match wiring connection requirements for indicated controller, with required motor leads brought to motor terminal box to suit control method.
- C. Motors Used with Adjustable-Frequency Controllers: Inverter Duty. Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
1. Critical vibration frequencies are not within operating range of controller output.
  2. Temperature Rise: Match rating for Class B insulation.
  3. Insulation: Class F.
  4. Thermal Protection: Conform to NEMA MG 1 requirements for thermally protected motors.

5. Current Protection: Factory installed shaft grounding system to electrically insulate bearings to prevent damage due to stray shaft currents to ground.
- D. Rugged-Duty Motors: Where indicated, motors are totally enclosed with 1.25 minimum service factor, greased bearings, integral condensate drains, and capped relief vents. Windings are insulated with non-hygroscopic material. External finish is chemical-resistant paint over corrosion-resistant primer.
- E. All motors installed outdoors shall be Totally Enclosed Fan Cooled.
- F. Source Quality Control: Perform the following routine tests according to NEMA MG 1:
  1. Measurement of winding resistance.
  2. No-load readings of current and speed at rated voltage and frequency.
  3. Locked rotor current at rated frequency.
  4. High-potential test.
  5. Alignment.

## 2.4 SINGLE-PHASE MOTORS

- A. Type: As indicated or selected by manufacturer from one of the following, to suit starting torque and other requirements of specific motor application.
  1. Permanent-split capacitor.
  2. Split-phase start, capacitor run.
  3. Capacitor start, capacitor run.
- B. Shaded-Pole Motors: Do not use, unless motors are smaller than 1/20 HP.
- C. Thermal Protection: Where indicated or required, internal protection automatically opens power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device automatically resets when motor temperature returns to normal range, unless otherwise indicated.
- D. Bearings: Ball-bearing type for belt-connected motors and other motors with high radial forces on motor shaft. Sealed, pre-lubricated sleeve bearings for other single-phase motors.

## 2.5 ELECTRICALLY COMMUTATED (EC) MOTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. ebm-papst
  2. Rosenberg
  3. Ziehl-Abegg
  4. Approved Equal

- B. Factory mounted, line-fed variable speed, Electrically Commutated (EC), external-rotor motor with maintenance-free ball bearings and permanent lubrication specifically designed for fan applications.
  - 1. Provide motor with maintenance-free, permanently lubricated, heavy duty bearings to match the fan load.
  
- C. Type: As indicated or selected by manufacturer from one of the following, to suit starting torque and other requirements of specific motor application.
  - 1. Permanent-split capacitor.
  - 2. Split-phase start, capacitor run.
  - 3. Capacitor start, capacitor run.
  - 4. Motors shall be with maintenance-free, permanently lubricated with heavy duty ball bearings to match the fan load and pre-wired to the specific voltage and phase.
  - 5. Motors shall include integrated electronic control board to convert AC power supplied to the fan to DC power to operate the motor with direct micro-processing control signaling for fan speed control, soft starting capabilities and integrated current limitations.
  - 6. Motor shall be speed controllable down to 5% of full speed (95% turndown).
  
- D. Motor shall be a minimum of 85% efficient at all speeds
  
- E. Wide voltage input:
  - 1. Single phase: 200-277V, 50/60 Hz respectively
  - 2. Three phase: 380-480V, 50/60 Hz respectively
  
- F. Robust mechanical design with IP 55 type of protection and insulation class "F".
  
- G. Die-cast aluminum closed and compact design with integrated electronics.
  
- H. Technical Features:
  - 1. Continuous operation
  - 2. PFC (passive)
  - 3. Integrated PID controller
  - 4. Control input 0-10VDC or 4-20 mA
  - 5. Input for sensor 0-10V or 4-20 mA
  - 6. Slave output 0-10V max. 5 mA
  - 7. Output 20VDC ( $\pm 25\%$  /  $-10\%$ ) max. 50 mA
  - 8. Output 10VDC ( $+3\%$ ) max. 10 mA
  - 9. RS485 MODBUS
  - 10. Motor current limitation
  - 11. Short-circuit protection
  - 12. Alarm relay with zero-potential change-over contacts (250VAC/2A,  $\cos \phi = 1$ )
  - 13. Line undervoltage / phase failure detection
  - 14. Over-temperature protected electronics / motor

15. Locked-rotor protection, soft start
16. Digital inputs for day/night switch, enabling, cooling / heating
17. EMC:
  - a. Interference emission acc.to EN 61000-6-3
  - b. Interference immunity acc.to EN 61000-6-2
  - c. Harmonics acc.to EN 61000-3-2/3
18. Leakage current: < 3,5 mA acc.to EN 61800-5-1
19. Connection leads: Via terminal box
20. Protection class: I (acc.to EN 61800-5-1)
21. Approvals: UL

### PART 3 - EXECUTION

#### 3.1 ADJUSTING

- A. Use adjustable motor mounting bases for belt-driven motors.
- B. Align pulleys and install belts.
- C. Tension according to manufacturer's written instructions.

END OF SECTION